

SCOPE OF THE INVENTION

1. A spring forming apparatus, comprising:

means for forcibly feeding a linear material having at least a pair of feeding rollers for feeding said material to a spring forming stage via a quill;

revolving means for revolving said feeding rollers about the axis of said linear material to twist the material fed out of the leading end of said quill, thereby changing the circumferential position, or angular position, of said material relative to said spring forming stage;

a multiplicity of spring forming tools arranged radially on said spring forming stage, each of which is movable to and from said linear material in a direction substantially perpendicular to the axis of the linear material, said spring forming tools adapted to be advanced to abut against said material fed to said spring forming stage so as to bend, curve, or turn said material, thereby forming a spring, and

a quill moving means for moving said quill in the axial direction of said linear material; wherein

motions of said feeding means, revolving means, and quill moving means are controllable.

2. The spring forming apparatus according to claim 1, wherein

said quill moving means is a linear way slide table;

said quill is rotatable about the axis of said linear material by a quill rotating means; and

said quill rotating means, feeding means, and revolving means are axially fixed on said linear way slide table.

3. The spring forming apparatus according to claim 1, wherein

said spring forming tools are radially arranged, and angularly spaced apart at regular angular intervals, on the front end of a main plate that constitutes said spring forming stage, each of said spring forming tools mounted on a tool slide table and driven in the radial direction thereof by a first servomotor via a crank mechanism to and away from said spring forming table;

said main plate having on the backside thereof a rotatably supported ring gear that surrounds said spring forming stage and is driven by a second servomotor mounted on said main plate;

each of the tool slide tables constituting a bending tool provided with a rotational bending unit, and

a power transmission gear mechanism is provided between said rotational bending unit and said ring gear to transmit the torque of said ring gear to said rotational bending unit without interfering with advancing and receding motions of said tool slide table.

4. The spring forming apparatus according to claim 3, wherein

said power transmission gear mechanism has a drive shaft installed on said main plate in parallel with the sliding direction of said tool slide table and a coaxial driven shaft installed on said rotational bending unit such that said drive shaft and driven shaft are mutually slidable in the coaxial direction but locked in the circumferential direction.

5. The spring forming apparatus according to claim 3, wherein holes for installing said transmission gear mechanisms are formed in the main plate at regular angular intervals.

6. The spring forming apparatus according to claim 3, wherein

each of the tool slide tables constituting a coil forming tool is provided with a tool rotating unit having a pair of dextral and sinistral coil forming tools mounted on a

rotatable tool holder having a rotary shaft oriented in the direction parallel to the advancing/receding direction of said tool slide table, said coil forming tools opposing each other across said rotary shaft; and further comprising:

a third servomotor for rotating said tool holder.